

*Electronic Supplementary Information (ESI)*

**Separation and recovery of heavy metal ions and salty ions from  
wastewater by 3D graphene-based asymmetric electrodes *via*  
capacitive deionization**

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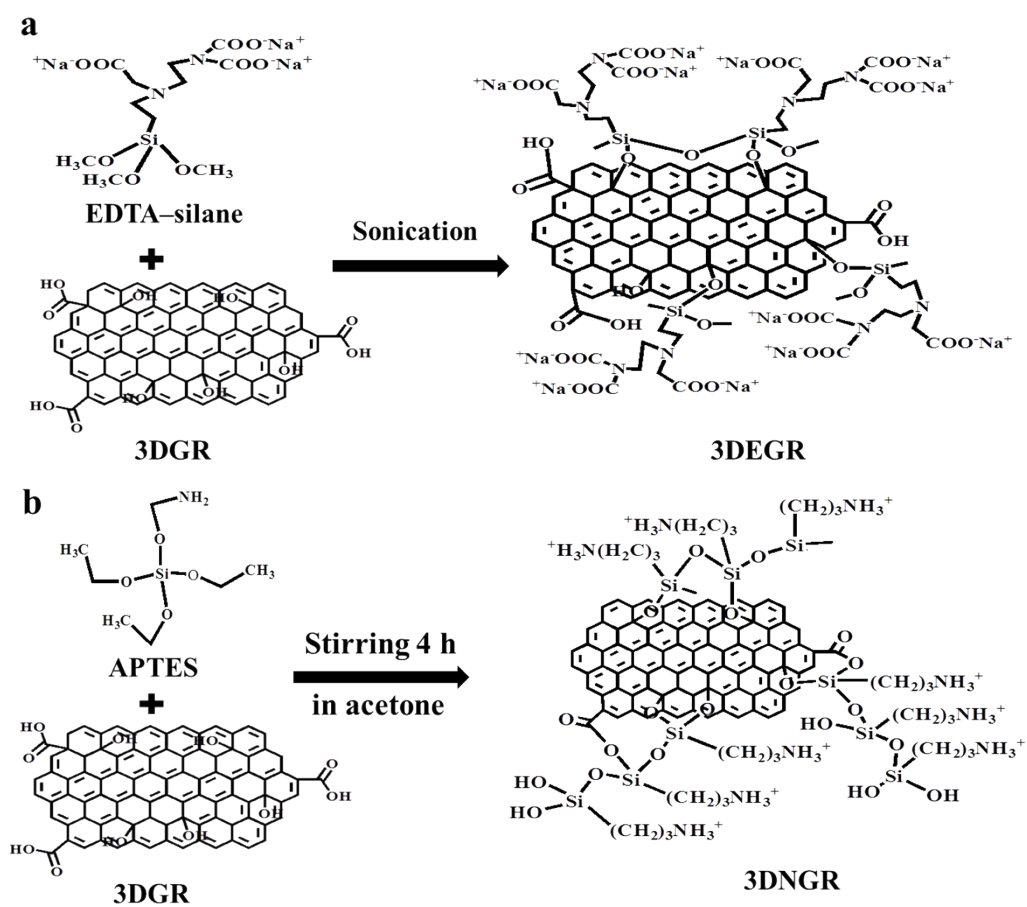


Fig. S1 Schematic illustration for preparation of (a) 3DEGR and (b) 3DNGR.

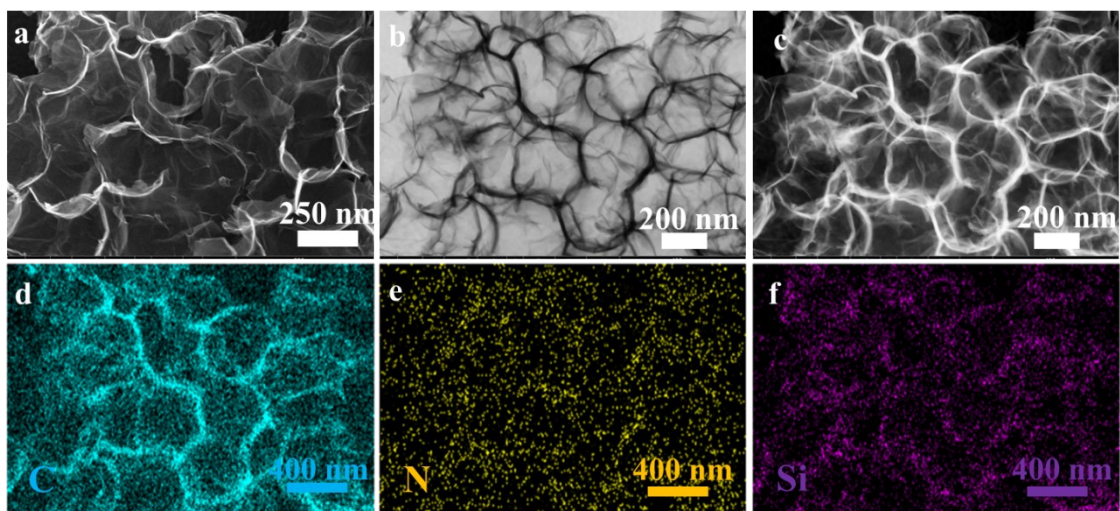


Fig. S2 (a) SEM images of 3DNGR. TEM images of 3DNGR in (b) bright field mode and (c) dark field mode. (d-f) Elemental mapping images of 3DNGR.

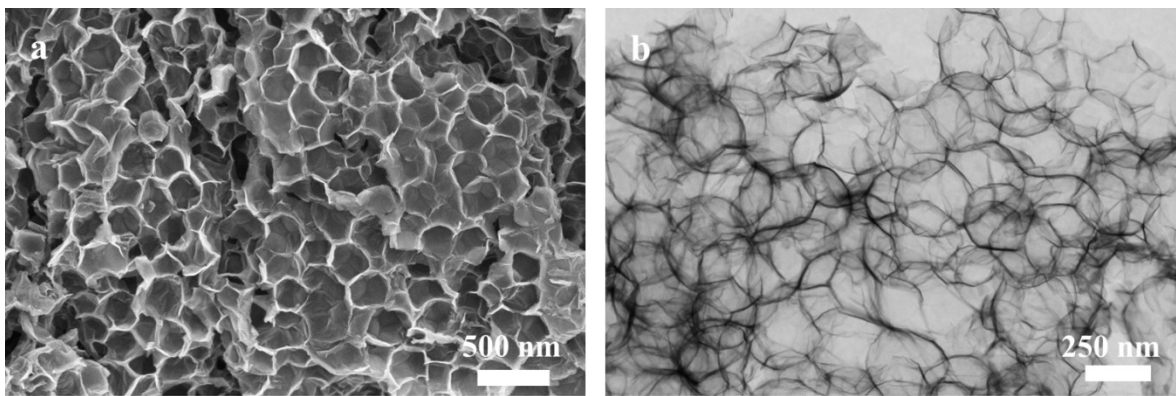


Fig. S3 (a) SEM and (b) TEM images of 3DGR.

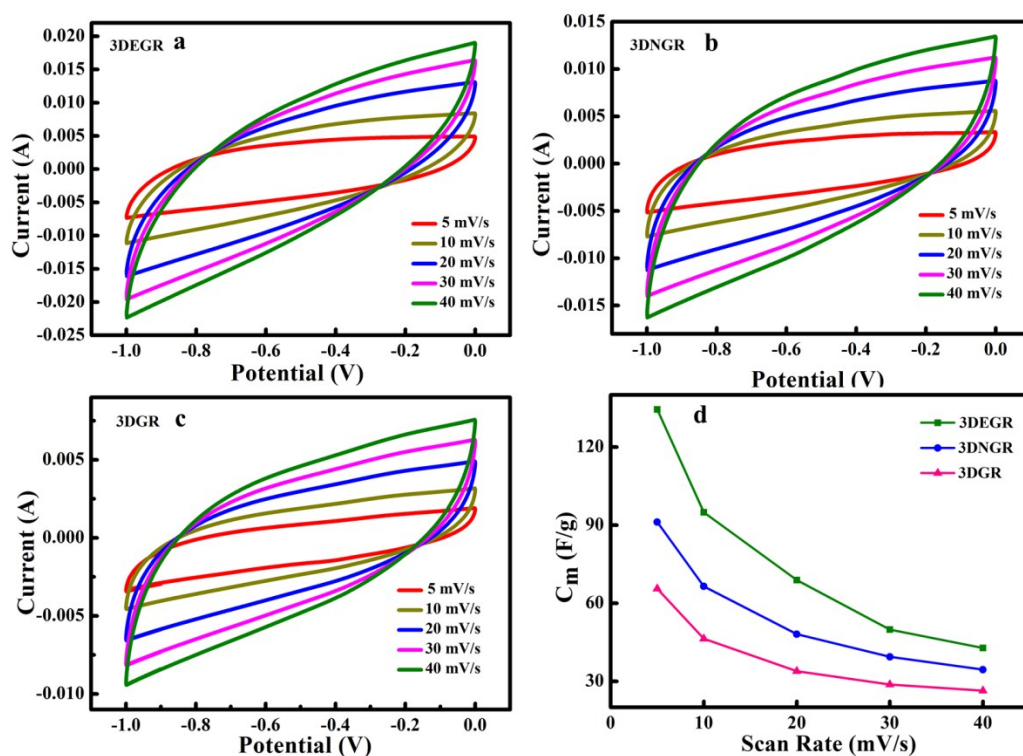


Fig. S4 CV curves of (a) 3DEGR, (b) 3DNGR and (c) 3DGR at different scan rates. (d) The scan rate dependence of the specific capacitance of 3DGR, 3DNGR and 3DSGR electrodes.

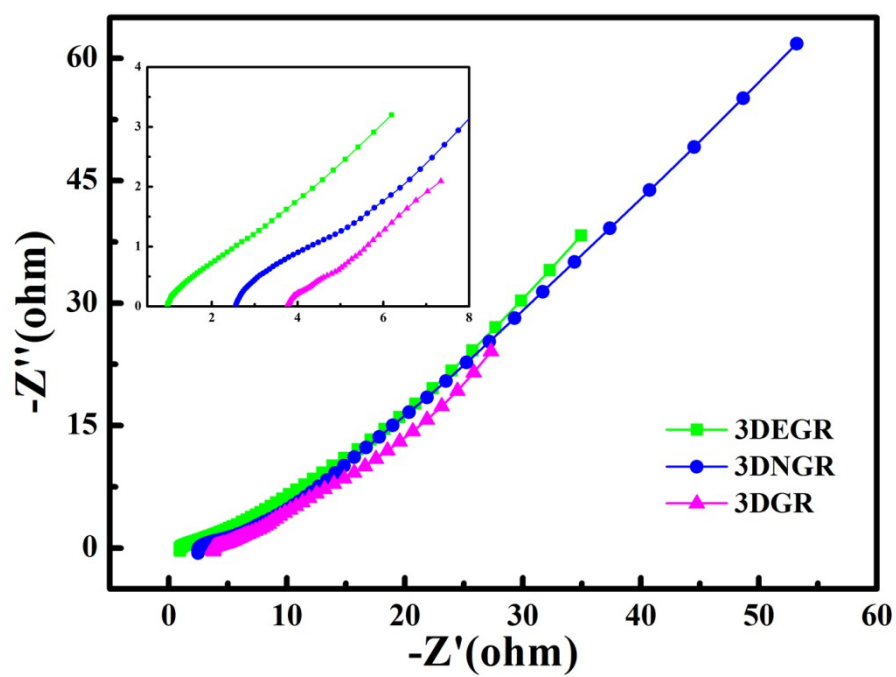


Fig. S5 EIS presented as Nyquist plots of 3DEGR, 3DNGR and 3DGR electrodes in a 0.5 M NaCl solution. The inset is the enlarged view of the high frequency region.

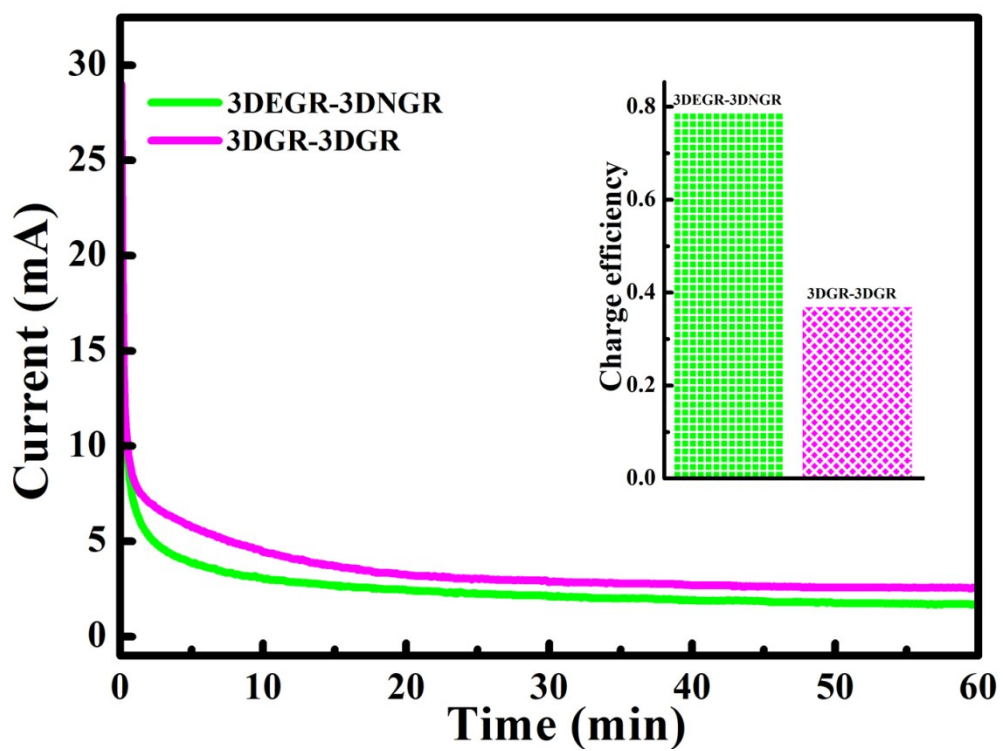


Fig. S6 Current transient for 3DEGR-3DNNGR and 3DGR-3DGR electrodes in a 35 mL  $\text{Pb}^{2+}$  and  $\text{Na}^+$  mixture solution with a flow rate of  $40 \text{ mL min}^{-1}$  at 1.4V.

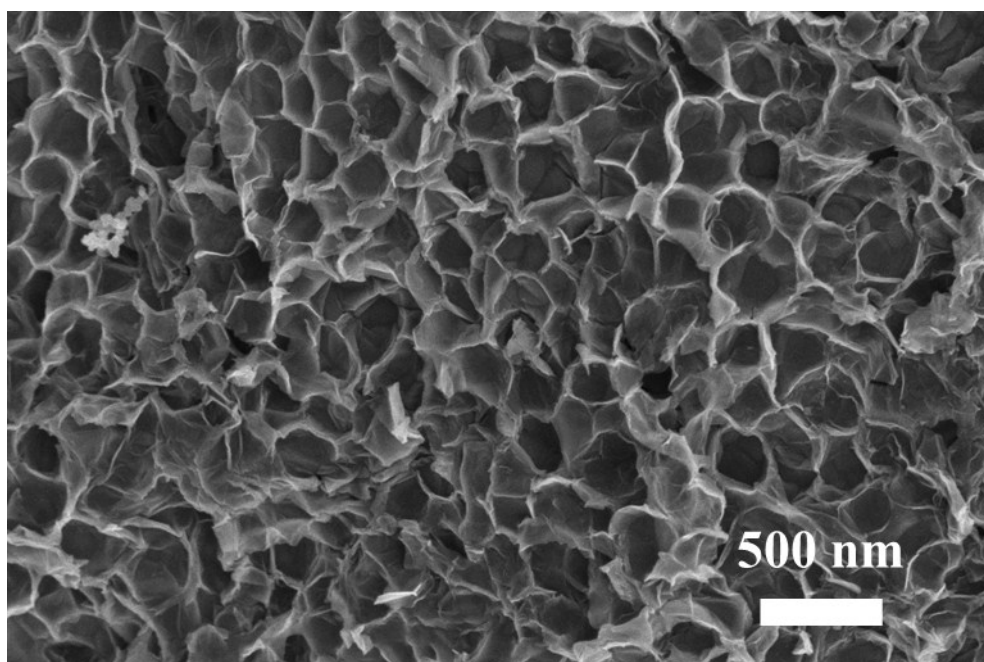


Fig. S7 SEM images of 3DEGR electrode after CDI.



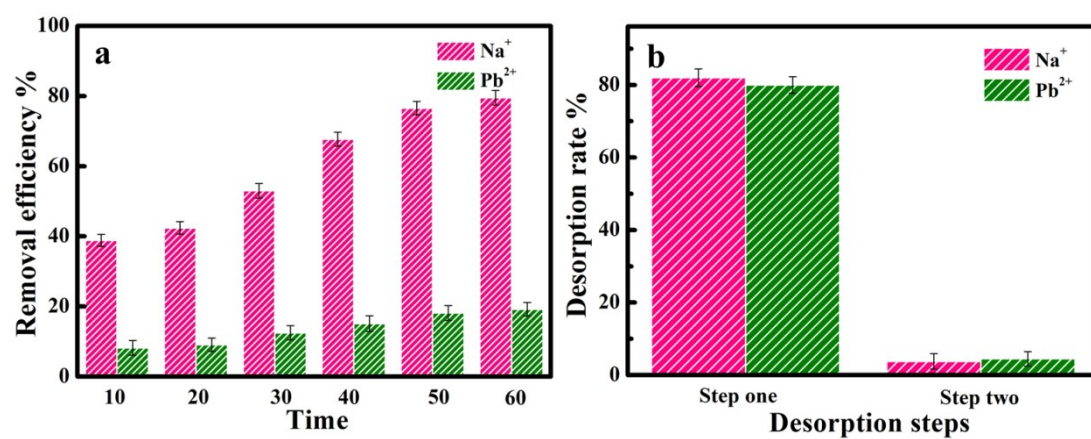


Fig. S8 (a) Adsorption and (b) desorption of  $\text{Pb}^{2+}$  and  $\text{Na}^+$  by 3DGR-based electrodes *via* CDI.